

The triangles BCI, ICA being isosceles, we have the angle IA or IP right to B = CB right to O; but PA or PI right to B = OC right to B; therefore the angle BC right to O = angle BI right to P, and the equiangular triangles OCB, PIB give $BC : BI :: BO : BP$.

And since the angle BC right to O = BI right to P, we have the angle BC right to I = BO right to P; and, therefore, since $BC : BI :: BO : BP$, the triangles BCI, BOP, are similar, and give $OB : OP :: CB : CI$.

Hence, as $CB = CI$ we have $OB = OP$

COROLLARY.

If P' be the position of P infinitely near to or coincident with B, then P'B is tangent at B; and putting MM for this tangent, we have angle BA right to M = PA right to B = OC right to B, and \therefore BM is perpendicular to BO.

ART. II.—*A Communication from the Reverend W. B. CLARKE, of Sydney, to His Excellency Sir HENRY BARKLY, K.C.B., &c., &c., President of the Royal Society of Victoria, on Professor McCoy's "New Tæniopteris" from the Coal-bearing Rocks of the Cape Paterson District in particular, and on the Evidence bearing on the Question of the Age of Australian Coal Beds in general.—Communicated to the Society by His Excellency THE PRESIDENT.*

[Read before the Royal Society, 25th June, 1860.]

St. Leonard's, 1st June, 1860.

MY DEAR SIR,

I RECEIVED with much thankfulness the kind reply which you were good enough to send to the letter which I did myself the honour of addressing to your Excellency.

The information contained in it respecting the discovery of *Tæniopteris*, at Cape Paterson, is very interesting. But I

hesitate, at present, to admit that such a discovery determines the fact of the existence of the Jurassic formation in Victoria. Of course, not knowing what species have been found, or even if the genus be really *Teniopteris* (for many of those plants so called are not *Teniopteris* at all), it is impossible for me to come to any conclusion on the subject. But in a paper which I propose to write, so soon as I can find leisure, I will endeavour to show what are the real grounds upon which I have ventured to contend, and still do contend, against the sweeping assertion of those geologists who maintain that a formation so abundant in zoological fossils (more so than, perhaps, any other) as the Jurassic, is found here, where no one, in any part of the Australian continent, has ever detected one single species, on the strength of the evidence derived from a few (probably not six in all) species of plants, the true description of which does not agree in all things with the typical characters of the genera under which the species are ranked.

The two genera, *Teniopteris* and *Glossopteris* (*Sagenopteris*), have been the means of placing, by some geologists, the coal deposits of Australia and India in the horizon of the oolitic coal. Now the latter occurs in no less than five distinct formations in India, as Mr. Oldham informs me, and it also occurs in Africa, where the evidence appears to be against the supposed epoch.

As to *Teniopteris*, so far from the genus determining the age of a formation, Jukes, who follows Bronn, assigns the species thus:—

Carboniferous	1	} Oolitic 6, not 7.
Permian	..	..	2
Trias	..	..	3
Oolitic	..	..	6
Tertiary	..	..	1

It is, therefore, the species which must determine whether the new found plants belong to the oolites or not; and when we come to Yorkshire, which is one of the references, we find in Phillips no figure of any species of *Teniopteris*, and only one catalogued *T. latifolia*, of which he gives as synonym *T. major* of Lindley and Hutton, which is not a *Teniopteris* at all, *i.e.* if we are to regard Brongniart's description of the genus as that to which we are, undoubtedly, to have respect. Again, Morris assigns to *T. major* the synonym *Aspidites Williamsonis*, from Göppert, to which genus it certainly belongs. The last writer also shows that another species, *T.*

vittata, which Morris classes as Phillips' *Scolopendrium solitarium*, the figures of which, in Brongniart and Phillips, are neither in agreement with Brongniart's generic characters of *Teniopteris*, is an *Aspidites*, viz., *A. teniopteris*, and so of others. It appears therefore, to me, that, without taking any positive evidence from stratigraphical data into account, to assign an epoch to an enormous formation (for such it is in this colony), in which no zoological evidence has been detected on account of *even two* genera of plants, the species of which are in the present condition, and the genera of which are referable to more than the assumed epoch, is anything but philosophical.

Mr. Morris, rather on the absence of certain forms, than on the presence of what Strzelecki had collected, though admitting the full force of conclusions from the examination of his plants, thought, in 1845, that in Australia the carboniferous formation had a different vegetable facies from what it had in Europe. And later, Mr. McCoy, who knew nothing of Australian plants, except from the collections which I had made and sent to Professor Sedgwick, came to a conclusion which I have always considered hasty, that because of the absence of certain genera, and the presence of others which have a relation to some oolitic species, there are two carboniferous formations "without any confusion of type," one of which was then shown to be at the base of the mountain limestone, and the other assumed to be oolitic. At the time, I requested, in a note to the *Philosophical Magazine*, that geologists would suspend their judgment on the point in dispute. Since then, in full confirmation of what I stated in a paper read to the Geological Society of London, others besides myself have found some of the missing true coal plants, and I am now in a position to point out six localities in this colony, and in Queensland, where they are to be found; and I was glad to see, on my first visit this year to the Melbourne Museum, that one of the said plants had also found its way from Gipps Land, whence I had long before had fine carboniferous specimens.

The whole question, then, is resolved into this: are there really two carboniferous formations?

Professor McCoy has admitted my facts in his paper on the Clark-Sedgwick fossils, in adopting my habitats. But he was slow in admitting what I stated to him in February last, that now we have found, in New South Wales, coal

seams in the very heart of his mountain limestone fossils, and that plants known in the Newcastle beds, which he calls oolitic, were found at the very bottom of the whole series of these newly-opened beds, containing the mountain limestone fossils.

Whilst, then, such is the case, I look with great interest, but with great suspicion, on any alleged discovery of true jurassic or oolitic evidence, in the small patchy coal formation in Victoria.

And as what I saw in the museum of so-called *Glossopteris Browniana*, from Darley and Bacchus Marsh, did not appear to me to be certain evidence of the species even, I do not yet know how far even that genus, aided now by *Teniopteris*, will go to establish the probability of the supposition in question.

At the same time, I have no wish to speak otherwise than respectfully of Professor McCoy's judgment and learning. Only, I wish to know, whether the new plants are really what they are called?

Whilst on this topic I would mention, that there is a living genus of ferns in Africa, which Sir W. Hooker calls *Teniopteris*, which, however, does not agree with the fossil genus, nor belong, I believe, to the same group. But in India, and in the Islands of the Pacific, there is a genus, *Oleandra*, which does agree with Brongniart's definition; and which has its fructification like that of *Aspidites*, under which head I would class many so called *Teniopteris*.

I saw some months ago, at Elizabeth Bay, a large collection of ferns from the Pacific, in the collection of my friend Mr. Macleay, and I then recognised the peculiar form and structure which I have mentioned.

Would it be at all remarkable if every genus, or even many species of genera, of ferns found in our carboniferous formation, whatever its real epoch, should be found in some part of the lands in the Pacific?

The fossil mammals are represented by living forms—why not the fossil plants? Is it credible, that in the carboniferous epoch of Europe, though the sea swarmed with the same zoological genera and species, that the land should bear nothing but the identical plants of Europe, in Australia? Or, is it incredible that in Australia, plants might then exist which did not come into existence in Europe till long after?

I have been led to think on this by the discovery recently

of so many living genera of plants of Australia, &c., in a fossil state in the tertiaries of the Vienna basin.

Whilst there are so many increasing proofs of varying centres of life, all dogmatism on insufficient evidence must be held unsound.

It is only within a few days that I have had brought to me, from Brunswick, a collection which proves that there may be grounds yet found for placing some portions of what Mr. McCoy calls our oolitic beds, and which I consider parts of one series, going down to the true carboniferous of Europe, in a new light. In the Hartz, or a little to the north of it, there has been found a series with plants which lies between the Lias and the Keuper, and if these beds shall be found not to be Keuperian, they must still be considered older than the Lias.

Certainly one species is very much like a plant I showed to Mr. McCoy, and which he did not consider *Teniopteris*. The Ofen plant (for that is its locality), like that I took to Melbourne from the Wianamatta beds of the New South Wales series, and which I place on the exact horizon of the Barrabool Hills beds, from careful comparisons of the formations, *i.e.*, at the very top of our New South Wales coal beds, or rather coal formations, agrees with *Teniopteris* in the form and independence of the frond, and in the thickness of the midrib, but differs in the neuration, having only minute perpendicular simple nerves.

The Ofen plants have been found in Sweden, and have been, I think, described by Angelin. Professor Blasius discovered them near Brunswick. With them are found dicotyledonous leaves like the Myricaceæ, and others like Salix, Corylus, Oak, &c.

These are not ferns, as some persons at first believed.

There are also one Nilsonia, one Cycadites, Calamites and one Carpolithus, with some true ferns, and small portions of brown dirty coal and remains of wood.

The specimens brought hither are in a sad broken state, owing to accidents on board ship. But I give not my own determinations, but those of Dr. Blasius.

I would not be surprised, when the whole deposit of our carboniferous series shall be made known, if doubts should arise as to the confidence with which some persons speak as to the correlation of the Australian and Indian coal beds.

Trusting that you will kindly pardon this long letter, and

allow me to defer to another time the discussion in full of the subject of it,

I have the honor to remain,
 My dear Sir,
 Your Excellency's faithful servant,
 (Signed) W. B. CLARKE.

His Excellency Sir Henry Barkly, K.C.B.

P.S.—I have written the foregoing in haste ; but if any discussion arise at the Royal Society, to which my friend Dr. Müller wishes me to contribute a paper on the subject of the coal formation, and if your Excellency please, I have no objection that what I have written should be made use of. It might serve to foreshadow some points in the argument.

In my letter I have not alluded to *Virginia* ; but on reference to Mr. Bunbury's description of *Tæniopteris magnifolia*, brought by Mr. Lyell, and on which stress is laid, I find he considers it in some respects akin to the living *Oleandra pilosa*, which justifies what I have said before ; and I think his description of the neuration agrees very nearly with that of the plant I mentioned from Ofen, near Brunswick, and that also from my Wianamatta beds of Paramatta. (See what he says, Q. J. III., 281, 287.)

Nor have I said anything of India. But if we refer to M'Clelland's figures—(Report, 1850, t. XV., XVI.,) we shall see that his *T. spatulata* and *T. acuminata* are not *Tæniopteris* ; and his third species, *T. danaoides*, as defined by Göppert (p. 352), is an *Aspidites*.

The bearing of the reference to *Aspidites* is this : that it is a genus which is not confined to the Jurassic epoch ; and one species called *T. vittata* belongs to the Keuper. This last formation has more to do with us than some think.

Tæniopteris.

- I. (A Brongniart Hist. des Veg. Foss., tom I., p. 262.)
- (1.) Folia simplicia, integerrima.
 - (2.) Nervo medio crasso rigido.
 - (3.) Nervulis perpendicularibus.
 - (4.) Vel BASI furcatis.

Fructificatio punctiformis.

- II. (Göppert Die Fossilen Farnkräuter, p. 58.)
- (1.) Frons simplex—integerrima.

- (2.) Nervo medio crasso rigido.
- (3.) Nervulis perpendicularibus.
- (4.) Simplicibus vel BASI furcatis.

Die Arten dieser Gattung sind den Aspidien mit ganzen Wedeln ähnlich.

III. (Lindley and Hutton, Vol. I., p. XLVIII.)

- (1.) Leaves simple entire.
- (2.) With a stiff thick midrib.
- (3.) Veins perpendicular, simple,
- (4.) Or forked AT THE BASE.

They assign three species to Lias and Oolites, and give two figures :

- (a.) *Vittata*—not in agreement with the definition.
- (b.) *Major*—not, &c.

They admit that (a) is hardly distinguishable from the living Indian *Aspidium Wallichianum*; (b) may be almost identified with *Scolopendrium officinarum*, a living British plant.

(IV.) (Brongniart Prodrôme, p. 61.)

- (1.) Fronde simple, entière, étroite à bords parallèles, traversée, par
- (2.) une nervure moyenne, forte, épaisse, qui s'étend jusqu' à l' extrémité ; nervures secondaires
- (4.) presque simples ou bifurquée
- (3.) à la Base, presque perpendiculaire sur la nervure moyenne.